

PREDATION OF LADYBIRDS (COCCINELLIDAE) BY OTHER BEETLES

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IT IS GENERALLY assumed that the bright colouration of ladybirds is adaptive, serving to act as a memorable warning to potential enemies that ladybirds are chemically defended (e.g. Frazer and Rothschild, 1960; Tursch *et al.*, 1971; Pasteels *et al.*, 1973; Holloway *et al.*, 1991; Majerus, 1994). There is considerable evidence to suggest that many coccinellids are usually unpalatable to vertebrate predators (Pocock, 1911; Morton Jones, 1932; Marples *et al.*, 1989; Majerus and Majerus, 1997). However, a growing body of observations of coccinellids suggests that a range of predatory or parasitic arthropods may attack, kill and often consume ladybirds (Iperti, 1964; Majerus, 1989, 1994, 1997; Kutnetsov, 1993; Disney *et al.*, 1994; Hurst *et al.*, 1995; Hodek and Honek, 1996; Geoghegan *et al.*, *in prep.*). I here record a group of observations of predatory beetles, other than coccinellids, preying upon ladybirds. Reports of ladybird cannibalism, or of predation of one coccinellid species by another, both of which are of common occurrence, are omitted from this paper.

Observations

Observations of larval, pupal or adult coccinellids being attacked and consumed by predatory beetles were made by myself or recorders for the Cambridge Ladybird Survey, mainly on an encounter basis, between October 1984 and May 1996. Basic details of these observations are given in Table 1. All records are from England, Scotland or Wales. All predators observed were adult beetles.

In the case of attacks on adult ladybirds, the beetles consumed most of the abdomen, usually attacking from the back or sides. The elytra, thorax and head were rarely consumed.

Discussion

Given this series of observations, it seems plausible that some larger predatory beetles may impose significant losses on ladybird populations. About two-thirds of the observations were made in reasonable light around dawn or shortly before dusk. Very few were made during the day with the exception of those involving the diurnal *Cantharis* species. Most of the other predatory beetles observed are nocturnal species which forage, in the main, under cover of darkness. Thus, it is probable that these observations represent only a very small proportion of attacks. Some observations were made as a result of occasional specific searches, under-taken at night with a torch. On all of the few nights in question, at least one observation was recorded.

The number of observed instances of predation on the different species of coccinellid reflects the relative commonness of the species. None of the abundant species of British ladybird is absent from the listing. It thus seems probable that no British species of coccinellid is immune to predation by predatory beetles.

Table 1. Details of observations of Coleoptera (other than coccinellids) preying upon ladybirds (1984-1996). (Ladybirds eaten were adults unless otherwise stated.)

Predator species	Prey species and stage	Date and notes	
<i>Cicindela campestris</i>	<i>Chilocorus 2-pustulatus</i>	Aug. 1987	
<i>Carabus violaceus</i>	<i>Coccinella 7-punctata</i>	Jul. 1989	
	<i>C. 7-punctata</i>	Jun. 1993	
	<i>Adalia 2-punctata</i>	Jun. 1988	
<i>Carabus glabratus</i>	<i>C. 7-punctata</i>	Jul. 1992	
<i>Carabus nemoralis</i>	<i>C. 7-punctata</i>	Aug. 1985	
	<i>C. 7-punctata</i>	Aug. 1986	
	<i>C. 7-punctata</i>	Jul. 1991	
	<i>C. 7-punctata</i>	Aug. 1991	
<i>Nebria brevicollis</i>	<i>C. 7-punctata</i>	Jun. 1988	
	<i>C. 7-punctata</i>	Jun. 1988	
	<i>A. 2-punctata</i>	Jun. 1992	
	<i>A. 2-punctata</i>	Jul. 1992	
	<i>Adalia 10-punctata</i>	Aug. 1989	
	<i>A. 10-punctata</i> pupa	Jun. 1990, on lime bark	
	<i>C. 7-punctata</i> larva	Jun. 1991, under nettles	
	<i>C. 7-punctata</i> larva	Jun. 1991, under nettles	
	<i>C. 7-punctata</i> larva	Jul. 1993, on stone path	
	<i>Halyzia 16-guttata</i> larva	Jul. 1990, under sycamore	
<i>Nebria salia</i>	<i>Coccinella 11-punctata</i>	May 1986	
<i>Nebria gyllenhali</i>	<i>Anisosticta 19-punctata</i>	Jul. 1987	
<i>Broscus cephalotes</i>	<i>C. 11-punctata</i>	Jun. 1988	
<i>Bembidion femoratum</i>	<i>Thea 22-punctata</i> larva	Aug. 1988, on hogweed	
<i>Bembidion nitidulum</i>	<i>A. 19-punctata</i> larva & pupa	Jul. 1987, on reed-mace	
<i>Harpalus tardus</i>	<i>A. 2-punctata</i>	May 1986	
	<i>A. 2-punctata</i> pupa	Jun. 1991, under nettles	
	<i>Adonia variegata</i>	Sept. 1989	
<i>Dicheiotrachus gustavi</i>	<i>Calvia 14-guttata</i>	Jul. 1988	
<i>Stomis pumicatus</i>	<i>C. 7-punctata</i>	Aug. 1987	
<i>Abax parallelopipedus</i>	<i>C. 7-punctata</i>	Aug. 1989	
	<i>C. 7-punctata</i> pupa	Aug. 1985, on ground	
	<i>C. 7-punctata</i> pupa	Aug. 1986, low vegetation	
	<i>C. 7-punctata</i> pupa	Aug. 1990, on wall	
	<i>C. 7-punctata</i> pupa	Jul. 1992, on ground	
	<i>C. 7-punctata</i> pupa	Jul. 1993, on wall	
	<i>C. 7-punctata</i> pupa	Aug. 1993, on wall	
	<i>C. 7-punctata</i> pupa	Aug. 1993, on ground	
	<i>C. 7-punctata</i> larva	Jul. 1988, on thistle	
	<i>C. 7-punctata</i> larva	Jul. 1988, on ground	
	<i>C. 7-punctata</i> larva	Jul. 1988, on ground	
	<i>Amara ovata</i>	<i>Subcoccinella 24-punctata</i>	Aug. 1992
	<i>Patrobus atrorufus</i>	<i>H. 16-guttata</i>	Jun. 1989

<i>Pterostichus nigrita</i>	<i>Propylea 14-punctata</i>	Jul. 1990
<i>Creophilus maxillosus</i>	<i>A. 2-punctata</i>	May 1987
<i>Staphylinus olens</i>	<i>C. 7-punctata</i>	Jul. 1990
	<i>C. 7-punctata</i>	Aug. 1993
	<i>C. 7-punctata</i>	Aug. 1993
	<i>C. 11-punctata</i>	Jul. 1988
	<i>C. 7-punctata</i>	Aug. 1991
<i>Dorcus parallelipedus</i>	<i>P. 14-punctata</i>	Aug. 1993
	<i>C. 7-punctata</i>	Jul. 1984
<i>Cantharis rustica</i>	<i>C. 7-punctata</i>	Jul. 1986
<i>Cantharis livida</i>	<i>C. 7-punctata</i>	Jul. 1987
	<i>C. 7-punctata</i>	Jul. 1987
	<i>A. 2-punctata</i>	Jul. 1986
	<i>A. 2-punctata</i>	Jul. 1989
	<i>A. 2-punctata</i>	Jul. 1990
	<i>A. 2-punctata</i>	Jul. 1990
	<i>A. 2-punctata</i>	Jul. 1992
	<i>C. 7-punctata</i> larva	Jul. 1989, on thistle
	<i>C. 7-punctata</i> larva	Jul. 1993, on nettle
	<i>C. 7-punctata</i> larva	Jul. 1993, on thistle
	<i>Rhagonycha fulva</i>	<i>A. 2-punctata</i>
<i>A. 2-punctata</i>		Jul. 1991
<i>A. 2-punctata</i>		Jul. 1993
<i>A. 2-punctata</i>		Jul. 1993
<i>Exochomus 4-pustulatus</i>		Jul. 1988
<i>E. 4-pustulatus</i> larva		Jun. 1988, on thistle
<i>E. 4-pustulatus</i> larva		Jul. 1988, on pine

In most cases, beetles were already eating ladybirds when first seen. The initial attacks were only seen on two occasions. It is not clear from these observations whether encounters between predatory beetles and coccinellids ever result in the beetle being repulsed by the coccinellid's chemical defence. Specific laboratory experiments will be needed to clarify this point.

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A second Scottish record of *Ypsolopha sequella* (Clerck) (Lep.: Yponomeutidae)

The distribution of *Ypsolopha sequella* extends throughout England and Wales as far as the Scottish border (Agassiz, 1996. in Emmet (Ed.) *The moths and butterflies of Great Britain and Ireland*. **3**:97). A single record by Andrew Buckham from Denholm, Roxburghshire (VC 80) on 26 August 1975 was, until now, the only known incursion of this species across the border. On 16 September 1997 a second Scottish specimen of *Y. sequella* was found at rest on the trunk of a sycamore *Acer pseudoplatanus* tree near the Eastern General Hospital in Leith, Midlothian (VC 83; OS grid ref. NT 2875). It will be interesting to see if further expansion of its range occurs.— K.P. BLAND, 35 Charterhall Road, Edinburgh EH9 3HS and D.M. ROBERTSON, 3 Claremont Park, Leith, Edinburgh EH6 7PH.